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ENVIRONMENTAL TAXATION AND EMPLOYMENT

BY

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1 INTRODUCTION

In recent years, policymakers have shown an increasing interest in shifting the tax structure away from labor income towards pollution, with the dual objective to reduce environmental damage and increase employment. In particular, by using the revenues from environmental taxes to cut taxes on labor, governments may be able to reap a double dividend – not only a cleaner environment but also a higher level of employment (see, *e.g.*, Pearce (1991), Oates (1991), and Repetto *et al.* (1992)). This paper explores in some detail the impact on employment of an environmental tax reform – *i.e.* increasing pollution taxes – and using the revenues to reduce distortionary taxes. In doing so, the paper focuses on the second dividend, *i.e.* the employment impact. The effects on the environmental objectives of the government are discussed only if the environmental consequences of a tax reform generate important feedback effects on employment. By abstracting from the ecological benefits associated with an environmental tax reform, the paper does not provide a complete picture of the welfare effects. Indeed, even if such a reform harms employment, overall welfare may still rise if the ecological benefits offset the costs associated with lower employment.

The paper does not distinguish between, on the one hand, pollution taxes targeted at cutting pollution and, on the other hand, green taxes primarily aimed at raising public revenues. Indeed, the terms environmental taxes, green taxes, and pollution taxes are used interchangeably. Any environmental tax has effects on both environmental quality and public revenues. However, while it discusses environmental taxes in general, the paper focuses in particular on taxes on fossil fuels. The reason is that, within the class of environmental levies, these taxes exert the largest macroeconomic impact. In particular, they can yield significant amounts of tax revenue.

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An important assumption underlying the analysis is that lowering the tax burden on labor is an effective instrument to raise employment.[1] A lower tax burden on labor generally raises the income from work to the employee and reduces labor costs for the employer. The incidence of the tax cut, *i.e.* whether the lower tax burden is reflected primarily in lower wage costs per unit of output or higher after-tax wages depends on supply and demand elasticities and on various labor market institutions. In any case, a lower tax burden on labor is likely to stimulate the demand for labor by reducing labor costs. At the same time, by raising the after-tax wage, a lower tax burden boosts labor supply if the uncompensated wage elasticity is positive. This paper assumes that this elasticity is indeed positive.[2]

In order to explore the employment effect of tax policy, this paper examines the impact of taxes on after-tax wages and labor costs. In particular, taxes are said to be borne by labor if, given the level of wage costs per unit of output, they reduce the level of real after-tax wages. Accordingly, the paper analyzes not only labor-related charges to employers (*e.g.*, payroll taxes) but also other taxes that reduce after-tax wage income, such as personal income taxes. Taxes on consumption are relevant as well because they reduce the real value of a given level of the nominal wage. Even taxes on other inputs, such as capital, may reduce after-tax wages through general equilibrium effects. In particular, if these taxes discourage capital accumulation, they reduce labor productivity and hence before-tax wages. In this way, the ultimate burden of capital taxes falls on labor income so that these taxes amount to implicit taxes on labor. In taking a macroeconomic perspective, this paper explores how taxes affect after-tax wages in general equilibrium. Hence, the tax burden measure adopted in this paper includes not only labor taxes explicitly paid by workers but also 'implicit' taxes on labor. These latter taxes are collected elsewhere in the economy but are ultimately paid for by labor in terms of lower real after-tax wages.

For an environmental tax reform to benefit employment by reducing the tax burden on labor, two conditions must be met. First, the *overall* tax level should be contained. Second, the *distribution* of the tax burden should be moved away from workers to others, *i.e.* capital owners, the owners of resources, and the recipients of income transfers. Only if these two conditions are met, do workers face a lower tax burden.

Section 2 deals with the first condition. It explains that environmental taxes typically raise the overall burden of taxation on private incomes – even if the revenues are used to reduce other distortionary taxes rather than to raise public spending. The basic reason is that pollution taxes reduce 'subsidies' provided to

1 For empirical studies on the impact of taxation on employment, see *e.g.*, Bean, Layard, and Nickell (1986), and Coe (1990).

2 Most empirical studies indicate that the supply elasticity of married men is close to zero. However, the uncompensated supply elasticity for women is typically found to be significantly positive. As workers get more scope to select their own working hours, the labor supply elasticity is likely to rise.

the private sector in the form of underpriced pollution. In this way, environmental taxes cause the private sector to supply the public good of a cleaner environment. The associated additional abatement costs (or, in an alternative terminology, the lower subsidies to pollution) raise the overall tax burden as measured by the loss in private income due to government intervention. This measure for the tax burden is distinct from total tax revenues collected because it also includes 'implicit' or 'hidden' taxes and subsidies due to government regulations. In particular, it incorporates the 'excess burden' of taxation, *i.e.* the costs of taxation in excess of the revenues collected. Furthermore, it includes 'implicit' subsidies to pollution in the form of prices for pollution below social damage.

Section 3 compares the effects of alternative instruments of environmental policy that yield the same level of environmental quality. To protect employment, environmental policy should contain the overall tax burden. Hence, this section discusses the cost effectiveness of the instruments and it explores whether, in the presence of high distortionary taxes, instruments that generate public revenues are particularly attractive.

The second condition for an environmental tax reform to boost employment involves the distribution of the tax burden. In this connection, the terminology of shifting the tax burden away from labor to pollution can be somewhat misleading because it suggests that pollution can bear the burden of taxation. However, the incidence of taxes falls on people only. Accordingly, the burden of taxation (including the excess burden) is ultimately borne by labor, capital owners, the owners of resources, or those receiving transfer incomes from the government. The key question then becomes whether a change in the tax structure can shift the tax burden away from labor to those outside the labor force.[3] Section 4 therefore explores the ultimate incidence of pollution taxes.

The analysis in section 4 reveals that shifting the tax burden away from labor is difficult because of either economic reasons (for example, if capital is supplied elastically) or political and social complications (if a shift toward transfer recipients implies a less equitable income distribution). Policies that boost employment tend to be rather costly in terms of other policy priorities, such as an equitable income distribution. Policymakers must have access to several policy instruments if they pursue several objectives, including a high level of employment, an equitable income distribution, and a high quality of the environment. In particular, if governments are concerned about low levels of employment, they should generally employ alternative instruments targeted at the labor market. In this connection, section 5 explores complementary policies designed to improve the employment effects of environmental policy. Section 6 turns to the employment position of low-skilled workers – a group suffering from high (long-term) unemployment rates. It explores how the revenues from environmental taxes could be used to improve the employment prospects of these workers. In particular, the pros and

3 Another option is to shift the tax burden to the future by raising the fiscal deficit.

cons are investigated of shifting the tax burden either to those outside the labor force or to those earning middle and high incomes by making the tax system more progressive. Finally, section 7 contains the main policy conclusions.

2 THE OVERALL TAX BURDEN

2.1 *The Costs of a Cleaner Environment*

Pollution taxes raise the overall tax burden (*i.e.* the reduction in after-tax private incomes associated with a given level of public revenues) if the existing tax structure is aimed at revenue-raising rather than environmental protection and hence is optimal from a revenue-raising point of view. Intuitively, in order to enhance environmental quality, someone has to pay abatement costs. A cleaner environment is not a free lunch: just as other public priorities that require public spending, environmental policy imposes costs on the private sector.

Another way to understand why pollution taxes raise the overall tax burden (even if the overall level of collected revenues remains constant in the context of an environmental tax reform) is to realize that the primary objective of pollution taxes is not to raise revenues with the lowest cost to private income. Instead, these taxes aim at encouraging substitution toward activities that are less damaging to the natural environment. If agents respond to these incentives by changing their behavior, tax revenues fall and the government has to raise other tax rates in order to maintain the level of aggregate public revenues. As a result, the loss in private welfare over and above the revenues collected by the government, the so-called 'excess burden,' increases. Indeed, substituting environmental taxes, which tend to have a relatively narrow base, for broad-based taxes on labor reverses the movement in recent tax reforms towards broad-based taxes, which are likely to carry a relatively low excess burden.

The additional costs in terms of private income of raising a given amount of public revenue (*i.e.* the 'excess burden') correspond to the abatement costs. These compliance costs associated with environmental protection are 'hidden' in the sense that they are not reflected in higher tax revenues collected by the government. Indeed, if the government adopts pollution taxes for environmental objectives, the private sector in effect supplies the public good of the environment. The costs and benefits of environmental protection thus do not appear in the government budget.[4]

There is one exception to the presumption that an environmental tax reform raises the tax burden. In particular, if the initial tax structure is not optimal from a revenue-raising point of view, pollution taxes may reduce the overall burden of

4 The same holds true for other instruments of environmental policy aimed at changing private behavior, such as command-and-control types of regulation.

taxation on private incomes.[5] Political or distributional constraints may prevent the government from making the tax system more efficient as a revenue-raising device. Only by employing environmental taxes to generate the revenues to eliminate the inefficient taxes can the government formulate a 'package deal' that creates the social consensus needed to eliminate inefficient taxes.[6] In other words, environmental taxes act as the lubrication that allows a tax reform to eliminate particularly 'bad' taxes.[7]

Even in the presence of a suboptimal initial tax system, a fundamental trade-off exists between, on the one hand, beneficial environmental effects and, on the other hand, favorable employment effects. The more successful environmental policy is in improving the quality of the environment, the higher the overall tax burden is and thus the less likely an expansion of employment becomes. Pollution taxes illustrate this: if a pollution levy is successful in changing behavior, it does not generate much revenue, thereby reducing the scope for reducing distortionary taxes on labor. Indeed, for an environmental tax reform to reduce the overall tax burden, the pollution tax needs to be more effective in raising revenues compared to the tax that has been reduced.

It should also be noted that the marginal abatement costs associated with environmental protection tend to rise with the level of abatement. Whereas small levels of environmental taxes may impose only low abatement costs, large-scale taxes can impose a substantial burden on private incomes. Indeed, the erosion of the base of pollution taxes due to lower pollution yields more serious adverse consequences for tax revenues if initial pollution taxes are higher.

5 See Poterba (1993) and Goulder (1994). Another case in which pollution taxes may cut the tax burden is if polluting activities are subsidized or it market failures (such as imperfect information) cause abatement activities to be privately beneficial. In several developing countries, for example, energy is subsidized (see Shah and Larsson (1992)). Another advantage of introducing pollution taxes is that it may reduce tax evasion and avoidance. For any given tax, avoidance and evasion typically rise more than proportionally with the tax rates. Hence, the government may want to spread taxation over several distinct tax bases.

6 The overall tax burden could be reduced more if broad-based taxes, rather than pollution taxes, would replace the inefficient taxes. However, compared to pollution taxes, these broad-based taxes, which are explicitly aimed at revenue raising, may encounter more political obstacles.

7 The political economy view on pollution taxes is not clear cut (see also section III.3). In particular, those who hold a 'pessimistic' view of government may council against pollution taxes because these taxes provide a Leviathan government with more instruments to extract rents from the private sector. In this way, environmental taxes may raise rather than reduce the overall tax burden. Indeed, even if a government optimizes a social welfare function based on private private preferences, it may be optimal to raise the overall level of collected revenues if pollution taxes become available. Intuitively, pollution taxes may reduce the marginal cost of public funds. See Bovenberg and Van der Ploeg (1994a).

2.2 *The Benefits of a Cleaner Environment*

The incentive effects of pollution taxes not only raise abatement costs but also yield an 'excess benefit' in the form of better environmental quality. Indeed, an alternative interpretation is that environmental taxes reduce subsidies on pollution. These subsidies are 'financed' in the form of a lower level of environmental quality. However, the environment is typically a public consumption good: all residents benefit from higher environmental quality – irrespective of the amount of labor supplied or demanded. Whereas the excess benefit of pollution taxes is thus public, the abatement costs are borne privately. The benefit that agents enjoy from the higher level of environmental quality typically does not depend on hours worked. The costs, in contrast, are generally borne by those who collect private incomes from economic activity. The overall effect is to raise the overall tax burden on these economic actors. Reducing spending on public goods typically decreases the tax burden on private income. Cutting the implicit subsidies on pollution, in contrast, typically raises this tax burden: private incomes benefit from the subsidy while public goods (*i.e.* the environment) pay for the subsidy.

To assess the employment effects of a higher level of taxation, one should in principle take into account the employment effects of the public expenditures that are financed by the additional tax revenues. The overall impact of a larger public sector on employment may well be favorable if the additional tax revenues finance public investments that substantially boost labor productivity. However, if income transfers, rather than public investments are raised, labor supply is likely to fall on account of the positive income effect. In that case, the expenditure side thus exacerbates the adverse employment effects of the higher level of taxation.

Similarly, one should in principle explore the economic consequences of better environmental quality if pollution taxes succeed in enhancing environmental quality. If environmental quality enters household utility and is a close substitute for other consumption commodities and complementary to leisure, a better level of environmental quality raises the demand for leisure. In that case, the 'excess benefit' of pollution taxes reduces labor supply and thus strengthens the adverse employment effects associated with higher abatement costs.

However, if the environment acts as a public factor of production rather than a public consumption good, the environmental benefits are likely to boost rather than harm employment.[8] In that case, the net benefits of participating in the economic process may rise. Labor productivity, for example, is likely to rise. Hence, the benefits of environmental policy accrue to workers rather than to those outside the labor force. However, the positive supply side effects of environmental policy often occur only in the long run, as a lower flow of pollution improves

8 For the distinction between the environment as a consumption good and as a production factor, see, *e.g.* Bovenberg and Smulders (1995).

the quality of the environment only gradually.[9] If this is so, there may be a case for allowing the fiscal deficit to rise so that the timing of the benefits coincides with the timing of the costs.

Most macroeconomic models exploring the consequences of an environmental tax reform abstract from feedback of environmental benefits on economic decisions. In particular, they ignore the impact of environmental benefits on labor demand and supply. In studying the employment effects of an environmental tax reform, also this paper assumes that an improved level of environmental quality does not directly affect the labor market.[10] This is a valid assumption if the environment is a public good that enters the utility function of households in a weakly separable way. In that case, a better environmental quality impacts neither labor supply by affecting the demand for leisure, nor labor demand by impacting labor productivity.

2.3 *The Welfare Effects of Pollution Taxes in a Second-best World*

The assumption underlying the analysis is that a high tax burden on labor reduces employment (see section 1). Hence, the higher tax burden associated with a cleaner environment tends to harm employment. This does not imply that environmental taxes decrease overall welfare: reducing distortions and stimulating employment are two distinct matters. In fact, environmental taxes correct the prices of environmental goods towards their appropriate social value. In other words, they reduce 'implicit' subsidies on pollution. To assess the overall welfare effects, the environmental benefits need to be weighted against the costs associated with a lower level of employment. Without labor market distortions, a fall in employment does not generate any first-order effects on welfare: the benefits from additional leisure exactly offset the costs associated with less production. In that case, environmental taxes contribute to a higher level of overall welfare. However, in the presence of labor market distortions, such as involuntary unemployment and distortionary taxes on labor, the social costs associated with less employment exceed the social benefits. Hence, a decline in employment yields a first-order loss in welfare. In that case, environmental taxes may reduce overall welfare, especially if the labor market distortions are serious.

This is a typical second-best result. The theory of the second best teaches that, in a world with remaining distortions, removing one particular distortion may not necessarily improve overall efficiency. Intuitively, the removal of one distortion may exacerbate the remaining distortions. This is exactly what may happen in

9 Note that in this case revenues do not transmit the benefits of environmental taxes. In fact, the more the environment improves, and hence the less revenues are generated by the pollution taxes, the more employment expands. Indeed, no trade-off exists between beneficial environmental impacts and favorable employment effects.

10 This procedure is comparable to assessing the impact of a tax increase without taking into account the economic effects of the public spending that is financed by the higher tax revenues.

case environmental taxes are implemented in a world with labor market distortions. In particular, by reducing employment, environmental taxes worsen the distortions due to an excessively low level of employment.

The second-best argument above suggests that a cleaner environment is an expensive commodity because, as a public good, it directly competes with other public priorities. In particular, environmental policy tends to exacerbate the tax distortions associated with the financing of other public goods. These additional costs of environmental policy are especially high if the marginal efficiency costs of the existing tax system are substantial. Therefore, the higher the marginal efficiency costs of the existing tax structure are, the higher the environmental benefits need to be in order to justify the additional costs of environmental policy in terrns of exacerbating pre-existing tax distortions.

Bovenberg and De Mooij (1994a) show that, in the presence of distortionary taxes, the optimal pollution tax lies below the Pigouvian tax, which fully internalizes the marginal social damage from pollution. Oates and Swabb (1988) also highlight the interaction between environmental policy and tax distortions. They demonstrate that, from the viewpoint of global efficiency, communities that require high distortionary taxes on mobile capital should set relatively lax environmental standards. This would serve to offset the distortions introduced by the taxes on capital. Following the pioneering work of Sandmo (1975), Bovenberg and Van der Ploeg (1994a) show that optimal environmental taxes decline with the scarcity of public funds as indicated by the marginal cost of public funds. Intuitively, the government employs the tax system to simultaneously accomplish two goals: raising revenues and internalizing environmental externalities. If public revenues become scarcer, as indicated by a higher marginal cost of public funds, the optimal tax system focuses more on generating revenues and less on internalizing pollution externalities. The conflict between raising revenues and protecting the environment exists because an environmental levy reduces pollution by encouraging taxpayers to avoid taxes. Tax avoidance not only reduces pollution but also makes it necessary to levy higher distortionary taxes to finance public spending. Accordingly, the larger the government's revenue needs are (as indicated by a higher marginal cost of public funds), the less the government can afford tax differentiation aimed at environmental protection. Indeed, the optimal pollution tax balances the social costs of pollution against the social benefits from additional tax revenues. Therefore, the higher the social value attached to tax revenue, the higher the marginal social costs of pollution have to be to justify a given environmental tax.

These results derived from simple analytical models are confirmed by simulations with numerical applied general equilibrium models. For example, using a dynamic computable general equilibrium model for the United States, Goulder (1995) finds that the gross[11] welfare costs of a carbon tax are about 40 percent

11 The term 'gross' means that the environmental benefits are not netted out.

higher if pre-existing distortionary taxes are 50 percent higher – even if the revenues from the carbon tax are used to cut distortionary taxes.

3 THE CHOICE BETWEEN ALTERNATIVE ENVIRONMENTAL POLICY INSTRUMENTS

The previous section explored the costs, especially in terms of employment, associated with different levels of environmental quality. An alternative approach is to take the environmental objectives (in terms of a particular quality of the environment) as given and to compare alternative instruments in terms of their impact on employment.

3.1 *Cost Effectiveness*

In the context of employment policy, it is typically best to target environmental policy instruments at environmental goals and then adjust instruments of labor market policy to offset the undesirable effects on employment. Indeed, environmental policy is a rather inefficient instrument for reaching labor market objectives. In order to enhance employment, the government should in principle adopt those environmental policy instruments that impose the lowest overall costs on the private sector. In this connection, the relative cost effectiveness of various instruments has been discussed at length in the literature (see, *e.g.*, Bohm and Russell (1985)). Market-based instruments may yield significant advantages over instruments based on command and control. In particular, they tend to achieve a more efficient allocation of abatement by relying on the knowledge and creativity that is available at the decentralized level and by ensuring that pollution is abated where it is cheapest to do so. Moreover, they typically provide stronger incentives for technological innovation aimed at reducing pollution. Often, market-based instruments also have drawbacks, however, which tend to be associated with particular market imperfections.[12] Relevant market imperfections include transaction costs, imperfect information, imperfect capital and insurance markets, market regulations, and market power. Hence, in selecting policy instruments, a case-by-case approach seems to be the best strategy.[13]

3.2 *The Limited Availability of Instruments*

The argument that, in order to minimize the damage to employment, the government should adopt the instruments that minimize the overall abatement costs assumes that the government has access to other instruments to redistribute the burden of environmental policy over workers and others. However, if the government

12 For a discussion in the context of carbon taxes, see Bovenberg (1993).

13 For a more extensive discussion of the advantages and disadvantages of market-based instruments, see OECD (1993, section 2.3).

cannot adjust other (labor market) instruments, not only the overall tax burden associated with a particular instrument of environmental policy, but also the distribution of this burden over workers and others becomes relevant. In that case, in order to enhance the performance of employment, the government should adopt those instruments that limit the burden on labor. This may imply that a given environmental policy instrument is preferred because it shifts the tax burden away from labor even though it generates a higher overall tax burden. The point is that the government is forced to employ only one instrument to achieve two objectives, namely a cleaner environment as well as a higher level of employment. Hence, it may have to compromise on narrowly defined cost effectiveness.

3.3 *Are Revenue-generating Instruments Preferable?*

It has been suggested that, in the presence of distortionary taxes, environmental policy instruments that generate public revenues (such as environmental taxes and auctioned tradable pollution permits) yield advantages over instruments that forego such revenues (such as regulation or grandfathered tradable permits). The reason is that the first class of instruments produce revenues that can be used to cut distortionary taxes (see, *e.g.*, OECD (1993, pp. 63–64)). This argument implicitly assumes that the generated revenues do not impose any additional costs. This, however, is not necessarily the case – especially not in a world with pre-existing distortions. To illustrate, if the incidence of the collected tax revenue falls on workers, while workers benefit only in part from the redistribution of the revenue, the overall tax burden on workers rises. Hence, employment is likely to fall. In the presence of a distortionary tax on labor, the decline in employment generates a first-order loss in welfare. Indeed, the collected revenues amount to a transfer of resources within society.[14] Whether such a transfer enhances overall efficiency is not clear *a priori* but depends on the incidence of the costs and the benefits of the transfer.

The income transfers implicit in environmental taxes can be seen as a complication rather than an advantage. In particular, these transfers typically result in a significant redistribution of income between various agents in the economy.[15] The tendency to offset these income effects is likely to complicate the overall tax system, thereby raising administrative and compliance costs. In any case, governments typically lack the instruments to completely neutralize the income effects. Hence, those who suffer capital losses will resist the reforms. Moreover, the in-

14 If polluters face regulation, they pay only the abatement costs. In the case of environmental taxes, in contrast, the burden on polluters consists of not only the abatement costs but also the taxes paid on the remaining pollution. Only the abatement costs constitute a net cost to society. The tax revenues amount to a transfer away from polluters to the rest of society.

15 This redistribution of income is especially large if polluting behavior is relatively inelastic. In that case, either the tax rates need to be very high to sufficiently reduce pollution, or pollution levels continue to be high and thus revenues on remaining pollution are high.

come transfers increase the incentives for rent-seeking behavior, as various lobby groups seek to take advantage of the revenues generated by the environmental taxes. Changes in tax rules may also raise uncertainty about future tax changes and property rights, more generally, thereby negatively affecting long-term investment decisions.

In view of these politico-economic considerations against environmental taxes, some have argued in favor of tax-free allowances. In this way, polluters would still face the appropriate incentives at the margin without the associated transfer of income associated with the collected revenues. These tax-free allowances, however, may result in excessive entry into the polluting sector (see, *e.g.* Cropper and Oates (1992)). Pezzey (1992), however, argues that entry could be prevented by fixing the total number of tax-free allowances and making them tradable. Such a system, however, may imply rather high transaction and administrative costs.

The discussion above reveals the importance of the incidence of environmental taxes. Who bears the burden of these taxes determines the employment effects and the relative performance of these instruments compared to alternative environmental policy instruments, including commandand-control measures. Moreover, the incidence determines whether offsetting measures are required to avoid adverse employment effects associated with a higher tax burden on labor. The next section explores the incidence of pollution taxes.

4 THE INCIDENCE OF POLLUTION TAXES

In discussing the incidence of environmental taxes, this section distinguishes between pollution levies collected on production sectors (sub-section 4.1) and environmental taxes levied on final consumers (sub-section 4.2).

4.1 *Taxes on Production*

4.1.1 Tradable outputs

Pollution taxes can be levied on production sectors in various ways. To illustrate, emissions of pollutants by industry can be subject to charges. Alternatively, the government may tax certain polluting inputs into production (*e.g.*, various forms of energy or fertilizers). These taxes are typically not refunded when the output of the production process is exported. Furthermore, imports of similar commodities do not face an equivalent tax.[16] Consequently, if a small country imposes a tax on the production process of a tradable commodity, domestic consumers escape the tax burden because they can buy the commodity from foreign produc-

16 GATT agreements generally do not allow such import levies. Another major reason for the absence of an import tax is that the government of an importing country typically does not have access to sufficient information to determine how much pollution foreign producers have caused in the course of producing the imported commodities and whether that pollution affects the importing country.

ers, which are not taxed, at an exogenously given world market price. Hence, the factors engaged in the production of this particular commodity tend to suffer the incidence of the tax.

4.1.2 Mobile factors

Which of the factors actually bears the brunt of the tax incidence depends on both the production structure and the supply elasticities of the various productive factors. A major determinant of the supply elasticities is the degree to which the various factors are mobile internationally. If all non-labor inputs (*e.g.*, capital and energy) are fully mobile internationally, these inputs can escape the tax burden by moving abroad. Accordingly, non-mobile labor bears the full incidence of the tax. In particular, a lower capital stock and lower energy demand reduce labor productivity, thereby raising unit labor costs (see Bovenberg and De Mooij (1995) and Bovenberg and Van der Ploeg (1994b)).[17] If workers feature firm-specific human capital, they cannot move to other industries to mitigate the fall in real wages. Hence, the fall in labor productivity imposes a heavy burden on those engaged in the taxed production processes. The adjustment is likely to involve unemployment in countries exhibiting rigid real wages and other labor market rigidities. In any case, governments will often face strong political pressure to compensate workers for their capital losses. This limits the funds that are available for reducing distortionary taxes on labor.

Capital flight due to higher pollution taxes may hurt the economy in other ways as well. In particular, with the capital, the country may also lose the expertise and technology that have been built up through years of learning by doing. Capital may exert other positive externalities on the rest of the economy as well. For example, it may help to finance public spending.

The case ot tradable outputs and mobile non-labor factors illustrates that, compared to alternative instruments of environmental policy, revenue-generating instruments may not always yield the best employment performance. In this particular case, taxes tend to imply a heavier burden on workers because labor bears the burden of not only the abatement costs but also the collected revenue.[18] Indeed, in this case, an environmental tax reform amounts to a replacement of explicit labor taxes by higher implicit labor taxes.[19]

4.1.3 Fixed factors

Other non-labor inputs share some of the incidence of pollution taxes in a small open economy if these inputs cannot move costlessly abroad. Indeed, in the short

17 Transfer recipients share this tax burden if the government links income transfers to wage developments.

18 For a formal model illustrating this point, see Bovenberg and De Mooij (1994b).

19 The implicit labor taxes are higher than the explicit taxes because pollution taxes involve abatement costs. Intuitively, the pollution taxes generate not only revenues to finance public spending but also increase the supply of the public good of the environment. See section II.a.

run, physical capital is likely to be rather immobile internationally. As a result, not only human capital but also the owners of physical capital suffer capital losses. In that case, the production structure becomes relevant. With a tax on a particular energy input into production, capital bears a relatively large share of the tax burden if, compared to labor, capital is a poorer substitute for energy (see Bovenberg and Van der Ploeg (1994c)). Empirical evidence suggests that capital and energy are complementary. Capital is thus likely to bear part of the tax burden on energy inputs. However, capital losses due to an unanticipated, implicit capital levy can cause increased policy uncertainty and, more seriously, harm the credibility of the authorities.[20] The associated deterioration of the investment climate may hurt capital formation and, therefore, labor productivity. Moreover, capital losses may limit the funds for investment aimed at cutting pollution, especially if firms are liquidity constrained. In any case, in the long run, capital is likely to be mobile internationally. Accordingly, it is able to escape the burden of environmental policy – at least in open economies.

4.1.4 International coordination

(i) Taxing capital

Capital can only be taxed on a sustainable basis by reducing the after-tax return if countries coordinate their tax policies. Even then, elastic saving behavior can shift the burden to labor – as lower saving reduces capital formation, thereby hurting labor productivity. Indeed, shifting the tax burden from labor to capital may be neither feasible nor desirable. A high tax burden on capital accumulation is particularly undesirable if capital formation yields major positive externalities, as is suggested by some of the literature on endogenous economic growth.

(ii) Terms-of-trade effects: shifting the burden to resource owners

The producers of the taxed input can also bear part of the burden of environmental policy. This is the case if a group of countries with monopsonistic market power reduces the world market price of the input by reducing worldwide demand. To illustrate, if OECD countries would raise taxes on fossil fuels, the oil price could fall substantially.[21] Accordingly, the terms of trade of the oil-importing countries would improve. The OPEC countries, in contrast, would suffer a

20 Investors may expect further substantial increases in implicit capital taxes in the form of pollution taxes if governments stress the link between pollution taxes and reductions in other taxes. However, if environmental taxes are motivated on environmental rather than revenue-raising grounds, investors may attach a lower probability to future increases in pollution taxes.

21 See, *e.g.*, Centraal Plan Bureau (1992).

terms-of-trade loss. In this way, oil-producing countries, rather than consumers in OECD countries, would bear the brunt of the tax.[22]

The terms-of-trade channel illustrates again the trade-off between employment and environmental effects. In particular, by shifting the tax burden away from workers in OECD countries, the decline in the oil price would most probably aid OECD employment performance. At the same time, however, the lower oil price would mitigate the incentives facing energy consumers to reduce their demand for oil. The ultimate reason why an internationally coordinated tax on fossil fuels would be ineffective to cut oil demand is that the supply of oil may be rather inelastic. Inelastic supply implies that the equilibrium impacts on oil demand and supply and on after-tax consumer prices are small, whereas the adverse effect on producer prices is large.

4.1.5 Non-tradable output: the case of sheltered sectors

If the output of the taxed production process is non-tradable, the domestic consumers of this commodity, rather than labor engaged in the production of that commodity, suffer the largest part of the incidence of a pollution tax collected on the production process.[23] One way to protect workers in energy-intensive sectors against the burden from energy taxes, is thus to limit the tax to sheltered sectors.[24] One complication in this respect is that it is difficult to distinguish the sheltered from the exposed sector. Furthermore, tax discrimination against the sheltered sector may cause serious distortions within the domestic economy. For example, a regressive tariff structure aimed at protecting large energy-intensive industries supplying tradable outputs may act as a barrier to entry and harm young dynamic firms. Moreover, it may put labor-intensive sectors at a relative disadvantage, thereby harming employment.

4.2 *Taxes on Consumption*

This sub-section turns to the incidence of indirect taxes on final consumption demand. These taxes are assumed to be levied according to the destination principle. Imports are thus taxed, while exports are not subject to tax. A tax on household demand for a particular type of energy (*e.g.*, the demand for gasoline) is an example of such a tax.

22 The terms of trade of a country pursuing ambitious environmental policies could also improve if that country has market power in the market for the commodities it supplies. In particular, by reducing the supply of these commodities, environmental policy may raise the world-market price of these goods. In this way, part of the incidence of pollution taxes can be shifted to foreign consumers. This effect depends crucially on the size of the trade elasticities. In particular, small trade elasticities allow countries to shift a large part of the tax burden to foreigners.

23 If the taxed input is non-tradable, the producers of that input share in the tax incidence.

24 The EC Commission's proposal for an EC carbon tax does exempt energy-intensive producers supplying tradable commodities.

4.2.1 Tradable commodities

These destination-based taxes are borne by consumers if they are imposed by a small open economy on tradable commodities. Producers can continue to sell their commodities abroad at fixed world market prices. Since exports are tax exempt, they escape the tax burden.[25] The fact that consumers rather than producers bear the burden of taxation yields four advantages from the perspective of improving the performance of employment. First, the tax is paid not only by those who consume out of labor income but also by those who consume out of transfer incomes. Hence, the tax does not reduce the incentive to search for work in the formal sector. Of course, this advantage is lost if the government compensates the recipients of transfer incomes for the fall in the real value of transfers.

Second, an unanticipated rise in the consumption tax amounts to an implicit capital levy on wealth that has been accumulated in the past. This implicit confiscation of the stock of wealth implies an important lump-sum element in the consumption tax.[26]

A third advantage of a consumption tax is that such a tax tends to spread the tax burden rather equally over various categories of laborers, especially if compared to the taxes discussed in section 4.1. This alleviates political pressure to use the revenues to compensate those who suffer capital losses. Moreover, it avoids unemployment among workers who are particularly hard hit.

The final advantage of consumption taxes involves nominal rigidities. In the presence of wage rigidities and a fixed nominal exchange rate, workers rather than employers bear the initial burden of the tax. However, this effect is likely to persist only in the short run. Over time, nominal wages are likely to rise as workers strive to maintain their real incomes (see also section 6.3).

4.2.2 Non-tradable commodities

In some cases, consumers may share the burden of indirect taxes with other economic agents. In particular, a tax on non-tradable consumption commodities may in part be borne by the production factors that are an input in the taxed commodity. Depending on relative demand and supply elasticities, the burden is shared between consumers and production factors. Hence, labor is likely to suffer if the tax is imposed on a non-tradable labor-intensive commodity.

4.2.3 International coordination

The burden of an indirect tax would also fall on producers if a large country or a group of countries with a dominant position in the world market were to in-

25 Producers would suffer the burden of taxes on tradable commodities if taxes were to be imposed according to the origin rather than the destination principle.

26 Auerbach and Kotlikoff (1987) stress the capital-levy feature of an unanticipated increase in consumption taxation. Whereas the implicit lump-sum tax on wealth enhances overall efficiency, it may have a price in terms of equity. In particular. the older generations, who typically own a large share of wealth, suffer a loss in welfare.

crease a destination-based tax on a tradable commodity. In that case, the world market price for the taxed commodity would decline, thereby imposing a burden on producers.

4.3 *Summing up*

Various types of pollution taxes differ in their impact on employment. At first sight, it may seem that, compared to a destination-based tax on final consumers, a tax on intermediary polluting inputs (such as fossil fuels) may be more effective in boosting employment because it induces substitution between these inputs and labor in production, both at a microlevel and through a restructuring of the industrial structure away from pollution-intensive to labor-intensive sectors. However, the employment impact also depends on the supply responses of the other factors of production. In fact, if non-labor inputs into tradable production are mobile internationally, the incidence of the tax falls entirely on labor. As far as tradable commodities produced with mobile non-labor factors are concerned, pollution taxes on final consumption are typically less damaging for employment than environmental taxes on intermediary inputs.

5 COMPLEMENTARY POLICIES

Governments should not necessarily refrain from adopting pollution taxes that are borne by labor. As argued in section 3.1, they should in principle adopt those environmental policy instruments that reach maximum environmental effects with lowest overall abatement costs – even if these costs are borne by labor. If the incidence of these instruments falls on labor, thereby threatening employment, other instruments should be used to shift the tax burden away from labor. Indeed, if the government aims for two objectives (*i.e.* a cleaner environment and a higher level of employment), it should in principle use at least two instruments. This section explores the complementary policies that could be used to limit the adverse employment effects of environmental policy in general and environmental taxes in particular.

5.1 *Real Wage Flexibility*

On the macroeconomic level, real wages should adjust to the higher tax burden associated with environmental policy. As discussed in section 2, abatement costs associated with environmental policy typically reduce the real after-tax wage consistent with high levels of employment. Hence, the government should pursue labor market policies aimed at mitigating real wage rigidities in order to prevent the costs associated with a more ambitious environmental policy from harming employment. In particular, insider-outsider mechanisms, which prevent unemployed outsiders from pricing themselves into jobs, should be critically exam-

ined. Elmeskov (1993) provides an overview of relevant institutional issues affecting real-wage flexibility. These issues include regulated pay scales, job security legislation, seniority systems, generous unemployment benefits, lax administration of unemployment benefits, and minimum wages. Many of these institutions and regulations amount to implicit 'taxes' on labor. Reducing these 'taxes' may be particularly attractive for those governments that face serious budgetary imbalances and are thus unable to reduce explicit taxes.[27]

In economies with wage bargaining on a national level, national unions may internalize the positive welfare effects of a better quality of the natural environment if pollution does not cross national borders. Accordingly, national bargaining may facilitate the moderation of real wages in response to a more ambitious environmental policy.[28] In this context, international coordination to tax capital income may help to create the national consensus required for wage moderation.

5.2 *Relative Wage Flexibility*

The degradation of the environment requires a structural change in the way economies operate: pollution-intensive sectors should contract while other sectors should expand. Accordingly, the market mechanism needs to function well to ensure that the associated reallocation of production factors can occur smoothly. A smooth operation of the labor market is particularly important in order to prevent widespread unemployment among workers currently employed in polluting industries. In this connection, flexibility of relative wages is important in order to give workers the appropriate signals. Furthermore, the tax and social security systems should provide workers with sufficient incentives to pursue training and to seek employment elsewhere. In particular, low marginal tax rates can contribute to rapid redeployment of labor by providing more incentives for training and relocation of labor across sectors, skills, and regions. Furthermore, deregulation of sheltered sectors (which tend to be labor-intensive) facilitates the redeployment of labor. Indeed, ambitious environmental objectives increase the need for structural adjustment in labor and commodity markets.

A lower level of public spending may prevent environmental policy from reducing employment. In this way, other public priorities make room for the public priority of the environment so that a rise in the overall tax burden can be

27 In the presence of insider-outsider mechanisms, changes in the overall tax burden may asymmetrically impact employment. Whereas higher taxes may reduce employment, lower taxes may not succeed in reversing the decline in employment. The reason is that higher taxes reduce the number of insiders. The remaining insiders absorb the benefits trom the tax cuts in the form of higher after-tax wages. In these circumstances, cuts in the tax burden aimed at expanding employment must be supplemented by measures to reduce the market power of insiders.

28 A number of studies have found a hump-shaped relationship between indicators of the centralization of bargaining and flexibility of real wages. For an overview, see Calmfors (1993). This study also explores the benefits and drawbacks of central bargaining.

avoided.[29] Moreover, a lower level of public spending creates the budgetary room to reduce marginal tax rates. Lower marginal tax rates may facilitate a smooth restructuring of the economy in the face of scarcer environmental resources.

5.3 *Environmental Policy*

Environmental policy itself can help to prevent adverse employment effects. In particular, the government should announce its environmental policy measures as far in advance as possible so that economic agents can anticipate them. This facilitates rapid adjustment and mitigates capital losses on firm-specific (human) capital. A gradual introduction of environmental policies also helps in this respect. Furthermore, international coordination of environmental policy aimed at particular sectors may allay large employment losses in countries that otherwise would unilaterally pursue stricter environmental policies. Such coordination would prevent sector-specific (human) capital from suffering major capital losses due to a decline in international competitiveness of the sectors it is engaged in. Sectoral unemployment would be thus mitigated. Moreover, budgetary means can be used to reduce distortionary taxes rather than to compensate the victims of unilateral environmental policy. In any particular country, simultaneously introducing pollution taxes affecting various sectors spreads the costs of environmental policy out over more agents. The revenues of the environmental taxes offer scope to contain the losses for any particular group through a general reduction in tax rates.

6 REDUCING THE TAX BURDEN ON LOW-INCOME WORKERS

6.1 *The Position of Low-skilled Labor*

The position of low-skilled workers is of particular concern. In many OECD countries, long-term unemployment is concentrated among low-skilled workers with low incomes. These unemployed workers tend to rapidly lose their working habits and their motivation to work, as they lack 'on-the-job' training and develop a state off 'learned helplessness.' Moreover, employers tend to screen these workers on their past employment history. As a result, these workers typically become disenfranchised and part of the hard core of the structurally unemployed. Indeed, low-skilled workers tend to make up the major part of the long-term unemployed in most European countries. The concentration of long-term unemployment among these workers gives rise to serious social tensions. With growing numbers of second earners and migrants expected to join the ranks of the low-skilled workers, these tensions are likely to intensify further in the near future. At

29 In this connection, a closer link between taxes and benefits (*i.e.* benefit taxation) may help to alleviate the distortionary effects of high tax rates. For example, some social security premiums could closer approximate actuarial conditions.

the same time, producers of tradable commodities face intensified competition from countries with plentiful low-skilled labor and thus low wages in Eastern Europe, Latin America, and Asia. This is likely to further reduce the demand for low-skilled labor in the exposed sectors in the OECD countries.

6.2 *Taxes and Low-skilled Labor*

These developments give rise to concern about the high implicit tax rates faced by these groups on the transition from unemployment to work in the official labor market (resulting in the so-called 'unemployment trap'). The replacement ratios for unemployment benefits tend to be the highest for low-income earners. The reason is that the earnings of these workers are closest to the social minimum, below which unemployment benefits are not allowed to decline for social reasons. Furthermore, the effective tax rates on work faced by low-income workers are particularly high due to the interaction of the tax system, social security contributions, means-tested social security benefits, and income-related prices. This reduces the incentive for schooling, effort, and working longer hours (the so-called 'poverty trap'). Moreover, high marginal and average tax rates encourage low-income workers to participate in the 'black' or 'shadow' economies rather than in the official labor market.

High average tax rates levied on low-income labor widen the wedge between after-tax wages and labor costs. If both the employer and the employee bear part of the tax wedge, labor supply in the formal sector declines due to a lower after-tax wage. Moreover, labor costs rise, thereby further reducing the demand for low-skilled labor. Recent tax reforms have reduced marginal tax rates mainly for high-income earners. Low-income workers, in contrast, continue to face high marginal tax rates.

In view of these concerns, the case for a reduction in the overall tax burden on low-income workers seems strong. In fact, various empirical studies suggest that demand elasticities for low-skilled workers are rather high.[30] Indeed, low-skilled labor tends to be a good substitute for energy and capital. Moreover, econometric studies suggest that the elasticity of labor supply is largest at low-income levels. In fact, labor supply may be backward bending at high incomes.

6.3 *Environmental Taxes: Shifting the Tax Burden*

For an environmental tax reform (*i.e.* a shift from taxes on labor to taxes on pollution) to benefit low-income earners, three conditions must be met. First, the incidence of the environmental tax should not fall entirely on low-income earn-

30 See, *e.g.*, Sneessens (1993), Hamermesh (1986, section 7), Johnson and Layard (1986, sections 3.3 and 3.4) and Elmeskov (1993, section 3.3.5).

ers. Second, the environmental tax should yield substantial revenues. Third, revenues should be used to cut taxes that are borne by low-income earners.

The first condition was discussed in section 4. It was found that the burden of destination-based taxes on tradable consumption commodities is shared between workers and those outside the labor force. The second condition requires that the pollution tax is not extremely successful in reducing pollution. Given the rather low price elasticity of energy demand, taxes on energy meet this condition. If the third condition is met, the overall effect is that the tax burden (including the additional excess burden associated with the pollution tax, see section 2) is shifted to others. Under the assumption that the government cannot shift the burden to resource owners and capital, the real incomes of either those outside the labor force or of middle and high-income workers must be reduced. We explore these two options below.

6.3.1 Reducing (real) non-labor incomes

To alleviate the unemployment trap, the government could widen the gap between the real value of unemployment benefits and income from work in the official labor market.[31] Reducing the real value of unemployment benefits also decreases wage pressure by reducing wage floors.[32] A decline in the real value of unemployment benefits requires that the unemployed should not benefit from the taxes that are reduced. To illustrate, if income taxes are paid on unemployment benefits, a reduction in the income tax may not be very effective in stimulating employment unless gross benefits are cut at the same time. Alternatively, governments may want to raise tax deductions or tax credits specifically targeted at the employed.

To target the tax reductions on labor, other taxpayers outside the labor force should not benefit from the tax cuts either. For example, if retirement benefits are included in the income tax net, a cut in the income tax paid by low-income workers may not be effective in stimulating employment because much of the tax cut would be absorbed by retirees with low incomes. Hence, cuts in payroll taxes, which are generally paid only by workers or their employers, tend to be more effective instruments to stimulate employment than reductions in income taxes, which are often also paid by those outside the labor force. However, in countries with a lot of part-time workers and individual taxation, a tax cut for low-income workers may not be targeted well at employing unemployed individuals who are unskilled. Instead, part-time workers, who may be skilled, may benefit. This may stimulate labor supply, as second earners are likely to feature relatively large la-

31 The tax system should play a more important role if the administrators of the benefit system are less able to enforce the obligation of the unemployed to search intensively for jobs.

32 Rather than using pollution taxes to cut the income of transfer recipients, the government can adopt more direct instruments, such as an increase in a broad-based consumption tax or a cut in nominal transfers, to shift the tax burden away from workers to transfer recipients. However, these instruments do not yield the beneficial environmental effects.

bor supply elasticities. The positive labor supply effect, however, puts downward pressure on wages and thus limits the benefits to low-skilled primary wage earners.

The employment effects of replacing social security contributions paid by employers by a destination-based tax on consumption are strengthened in the presence of nominal wage rigidity and fixed nominal exchange rates. In that case, the initial burden of consumption taxes is borne by workers rather than employers. This may boost labor demand. Indeed, a policy of substituting a destination-based tax, which implies tax-free exports, for an origin-based tax, which is not refunded for exports, can be viewed as an implicit depreciation.

Whether such a depreciation yields a long-lasting impact on employment depends on the importance of nominal rigidities and hysteresis in employment. In particular, nominal wages are likely to rise over time as workers seek to maintain their standard of living, thereby choking off the initial boost to labor demand. However, if the natural rate of unemployment depends on past levels of unemployment, a temporary rise in labor demand may produce permanent effects. These so-called hysteresis effects may arise if the human capital and the working skills of the unemployed depreciate rapidly or if unions do not take the interests of the unemployed into account when bargaining about wages (see, *e.g.*, Blanchard and Summers (1988)).

Substituting consumption taxes on pollution for payroll taxes may reduce labor costs on a more sustainable basis if the long-run shifting coefficient for payroll taxes exceeds that of pollution taxes. In that case, an environmental tax reform allows labor demand to expand because workers accept lower after-tax wages.[33] The empirical work on how various taxes are shifted into higher labor costs is rather inconclusive. In any case, an environmental tax reform may moderate wages if the government succeeds in creating a social consensus for wage moderation. In countries with centralized labor market institutions, the government may be able to bargain with national unions about wage moderation in exchange for a better quality of the environment. In that case, there is a case for linking employment and environmental issues in a package deal.[34]

6.3.2 Reducing high and middle incomes

A major reason for why governments have been hesitant to substantially reduce the tax burden on low-income earners is that a substantial reduction in average and marginal tax rates facing low incomes is rather costly in terms of lost tax

33 In this case, labor costs can decline without lowering the overall tax burden on labor. The idea of using environmental taxes to cut taxes on labor, in contrast, is to cut labor costs without having to cut after-tax wages. In any case, lower after-tax wages may generate adverse supply-side effects by reducing labor supply.

34 Conceptually, however, one could view this reform as the sum of two separate policies: one aimed at improving the quality of the environment (*i.e.* the pollution tax) and the other targeted at enhancing employment (*i.e.* reducing wage costs).

revenue. Cutting average tax rates paid by low-income earners also reduces taxes paid by high-income workers unless marginal tax rates are raised. In this respect, policymakers typically face the familiar trade-off between equity and efficiency. To finance the reductions in average and marginal tax rates of the low incomes, they can reduce the incomes of either those outside the labor force (see section 6.3.1) or of high-income earners (this sub-section). The first option is unattractive from an equity point of view.[35] The second option requires raising marginal tax rates, thereby harming incentives.

One way to target low-income earners is to use the revenues from an indirect environmental tax on consumption to introduce or raise tax credits for those who are employed. Alternatively, tax rates could be reduced for only the lowest incomes. This would happen, for example, if governments would cut social security contributions that are subject to a (low) ceiling.[36] These tax reforms imply that the overall marginal tax wedge (which consists of not only the unchanged income tax rate but also the increased indirect tax on consumption) rises (on incomes above the ceiling if the government selects the second option). Indeed, higher tax credits or tax allowances narrow the tax base, thereby requiring higher marginal taxes. Accordingly, the overall tax system becomes more progressive for those who are in the labor force.

(i) More progressivity: the advantages

A more progressive tax system may actually reduce unemployment through its effect on wage-setting behavior in non-competitive labor markets. If a non-competitive market generates excessive wage pressure, taxing wage increases by way of a progressive rate structure is one way to deal with market failure.[37] In particular, a more progressive tax reduces the incentive for unions to bargain for higher wages (see, *e.g.*, Hersoug (1984), Palokangas (1987), Malcomson and Sartor (1987), and Lockwood and Manning (1993)). Moreover, firms find it less attractive to pay efficiency wages (see, Hoel (1990)). Intuitively, marginal taxes moderate wages because they act like a tax on wage increases.

Another advantage of progressive taxes is that they may encourage part-time work and split jobs while reducing the incentives to work overtime and concentrate jobs in the hands of a relatively limited number of high-earning individuals. Moreover, in countries with individual taxation, progressive taxes may encourage second earners to participate in the labor force.

35 However, there may be a case for increasing tax rates on high retirement incomes. In this way, the tax burden is shifted from the working poor to the non-working rich.

36 Such a reform would not be possible in social security systems that feature an actuarially precise link between contributions and benefits. In these cases, social security contributions would presumably impose less (or no) distortions, anyway.

37 See, *e.g.*, Layard, Nickell, and Johnson (1991), who argue in favor of a tax-based income policy. This policy in fact amounts to progressive tax on wages combined with a lump-sum employment subsidy.

(ii) More progressivity: the disadvantages

Whereas high marginal tax rates may mitigate some distortions in non-competitive labor markets (like union power), they actually impose other distortions. In particular, a progressive tax harms the incentives to supply labor.[38] This is an especially serious drawback in modern economies with more flexible working practices in which agents have more and more leeway to select their own working hours. The increasing diversity in lifestyles and career patterns encourages employers to offer employees more options in selecting their own working patterns. Moreover, older workers tend to have more and more freedom of choice about when they retire. Hence, labor force participation in the age brackets from 55 to 65 years may become rather sensitive to tax rates. High marginal tax rates also encourage tax evasion and avoidance. The efforts of tax administrators to mitigate tax evasion tend to raise compliance costs and reduce the privacy of taxpayers. In view of those adverse incentive effects, high marginal tax rates on high-income earners tend to be rather ineffective in raising more revenues. This is in fact a major reason why many OECD governments have reduced these tax rates in recent years.

More importantly, high marginal rates erode the incentives to acquire more skills. The adverse impact on human capital accumulation is likely to impose substantial social costs, especially because the accumulation of human capital is likely to yield significant positive externalities. Moreover, low-income earners can be employed on a sustainable basis only if their productivity exceeds the socially acceptable minimum standard of living, which is reflected in social security benefits and minimum wages. In order to motivate low-income earners to increase their productivity through training, they should be given the perspective of higher future after-tax earnings associated with the accumulation of skills. Training and acquiring skills constitute the keys for breaking the vicious circle of poverty and unemployment and hence improve the trade-off between equity and efficiency by reducing the need to use distortionary instruments to redistribute income. Indeed, recent research on the interplay between income distribution and economic growth suggests that an equal distribution of income and wealth before taxes stimulates economic growth (see, *e.g.* Persson and Tabellini (1992)).

Shifting the tax burden to the middle-income workers reduces the incentives facing low-income earners to join the ranks of the middle-income workers through more work effort and by acquiring more skills. Just as helping the poor runs the risk of creating more poor, so may helping the low skilled produce more low-skilled workers.[39] This is a major dilemma facing public policy.

38 This is why Layard, Nickell, and Johnson (1991) propose a tax on hourly rather than weekly earnings.

39 If low-skilled workers are unemployed, they are likely to lose their skills altogether. This gives rise to hysteresis effects.

A more progressive tax system harms the productivity of middle-income workers, who constitute the backbone of the work force, through various channels. In particular, high marginal rates reduce effort and harm the motivation of the work force to perform well and acquire more skills. Motivation, training, and education are becoming increasingly important in modern economies in which production is decentralized and workers bear more responsibilities. Moreover, price signals in the form of wage differentials are seriously distorted by high marginal rates. This harms the efficiency with which the labor force is allocated across sectors and regions. More generally, it reduces the flexibility of the labor market in responding to shocks, including that of scarcer environmental resources. Overall, progressive tax systems seem to be at variance with the needs of OECD countries. These countries require well-trained, highly motivated, and highly productive labor forces in order to successfully compete with the newly industrialized countries while at the same time ensuring a socially acceptable standard of living for the increasing number of the aged and others who cannot participate in the labor force. Rather than use progressive taxation, governments should directly address distortions in non-competitive labor markets stemming from market power through deregulation of (non-traded) commodity markets, opening up markets to international competition, and breaking down insider-outsider mechanisms.

6.4 *Reducing Indirect Taxes on Labor-intensive Services*

As far as indirect taxes are concerned, destination-based taxes on tradable consumption commodities are borne by consumers. However, indirect taxes on non-traded services, which are labor-intensive, may in part be shifted to unskilled labor, especially if domestic demand for these services is relatively price elastic. Reducing indirect taxes on non-traded services that are intensive in (low-skilled) labor may thus constitute a way to raise employment.[40] In fact, the sheltered sectors, which tend to be rather labor-intensive, may constitute a promising way to employ low-skilled workers at socially acceptable wages. These sectors do not directly compete with trading partners with low wages. Another argument for reducing the tax burden on these service sectors is that these sectors suffer from serious tax evasion and avoidance. A major part of these non-traded low-skilled activities are typically performed in the 'black' and 'grey' economies.

These policies can, however, only be effective if various regulations do not deter new firms from entering and creating employment in the sheltered service sector. Hence, in many countries, deregulation of non-traded sectors is called for in order to ensure an adequate supply response. Moreover, the selection of sec-

40 In this case, the tax burden is borne by consumers, who are not compensated for the additional pollution taxes they pay, and capital and high-skilled labor, which suffer from the relatively high tax burden on capital and skill-intensive sectors.

tors to be exempted is likely to be problematic for both politico-economic and administrative reasons. In particular, tax incentives for selected sectors increase the discretionary element in tax policy. This is likely to encourage rent-seeking behavior, as various sectors will seek tax privileges. Rent-seeking harms the efficiency of the economy. Policing the distinction between tax-advantaged and other sectors often complicates the tax system and raises compliance and administration costs. In fact, one major reason why many countries have moved towards more uniform taxation is that uniform taxation tends to be more robust to changing political pressures. Hence, under uniform taxation, tax rules can be expected to be more stable, thereby improving the investment climate. Moreover, uniform tax systems tend to be easier to administrate.

Tax incentives for the labor-intensive sector would also seem to be a rather indirect instrument for strengthening the labor market position of low-skilled labor. Part of the benefits from these incentives is likely to leak away to consumers of these services. A more direct instrument for raising employment of the low skilled generally is the reduction of the wedge between labor costs and after-tax wages. This can be accomplished by cutting income taxes and social security contributions paid on the employment of these workers.

7 CONCLUSIONS

This paper has explored whether environmental taxes can both enhance the quality of the environment and raise employment. Its overall message is somewhat negative: Policymakers should not expect environmental policy in general, and environmental taxes in particular, to significantly contribute to solving the unemployment problems plaguing their economies. Shifting the tax burden away from labor is likely to be difficult for either economic, social, or political reasons. Moreover, environmental policy is likely to raise the 'hidden' part of the tax burden by increasing the abatement costs borne by the private sector (or, using an alternative terminology, by reducing pollution subsidies enjoyed by private agents). In view of the rise in the overall tax burden and the difficulties in shifting the tax burden away from labor, the overall tax burden borne by labor is likely to rise rather than fall – especially if environmental objectives are ambitious.

The failure of the double-dividend argument does not imply that environmental taxes should not be used. The case for environmental taxes should be made on environmental grounds (*i.e.* the first dividend) rather than employment effects (*i.e.* the second dividend). If governments are concerned about low levels of employment, they should employ alternative instruments targeted at the labor market. Indeed, policymakers must have access to several policy instruments if they pursue several objectives (including a high level of employment, an equitable income distribution, and a high quality of the environment).

The conceptual framework described in this paper also yields implications for

building models aimed at exploring the double-dividend issue. In particular, the analysis suggests that a number of crucial elements of a model determine the employment effects of an environmental tax reform:

1. The wage equation determines whether labor costs can decline because workers accept lower after-tax wages. In this context, model simulations should report the impacts on both after-tax wages and labor costs.
2. The adverse supply side consequences of high marginal tax rates determine whether the government can shift the tax burden away from low-skilled to high-skilled workers without generating serious distortions. Models that abstract from these supply side effects do not incorporate an important aspect of the trade-off between equity and efficiency.
3. International factor mobility and the production structure (*e.g.* whether capital and polluting inputs are complementary) determine whether the tax burden can be shifted toward non-labor production factors, such as capital.
4. Trade elasticities determine whether the tax burden can be shifted to foreigners.
5. Simulations should report the effects on the income distribution. This reveals whether the tax burden is shifted towards those outside the labor force, thereby possibly generating adverse consequences for the income distribution.
6. The degree of disaggregation of households and firms determines whether models can do justice to the rather unequal distribution of costs and benefits of environmental taxes (especially those on production) in a world with heterogeneous agents (and heterogeneous labor in particular).

The paper yields the following policy conclusions:

1. To reduce long-term unemployment, the tax burden on low skilled labor should be cut.
2. Shifting the tax burden from low-income to middle-income earners harms effort and the incentives to acquire skills. Moreover, high marginal rates slow down the adjustment of the economy towards an ecologically sustainable growth path.
3. Without an increase in marginal tax rates on labor incomes, a cut in the tax burden on low-income earners requires a higher tax burden on either the owners of wealth, the owners of natural resources, the recipients of income transfers, or a combination of these options.
4. In the short run, some shift of the tax burden towards capital may be feasible. However, taxing capital on a sustainable basis requires international coordination on a global level. Moreover, heavily taxing capital income may damage the economy.

5. Shifting the tax burden to resource owners (read OPEC) also requires international coordination. Another reason for international coordination is to prevent excessive capital losses for production factors engaged in pollution-intensive sectors.
6. Raising the tax burden on transfer incomes is attractive from an efficiency point of view. It improves labor market incentives and encourages wage moderation. However, it tends to hurt equity objectives.
7. The government typically faces a trade-off between equity and efficiency. An environmental tax reform that expands employment often produces a negative dividend in terms of other objectives of public policy (the distribution of income, in particular). Indeed, the revenues from pollution taxes can be used only once: either to compensate low-income groups for the higher tax burden or to reduce distortionary taxes.
8. As far as tradable commodities produced with mobile non-labor factors are concerned, pollution taxes on final consumption are typically less damaging for employment than environmental taxes on intermediary inputs. The reason is that those outside the labor force (including transfer recipients and wealth owners) share the burden of consumption taxes with workers. This advantage of consumption taxes vanishes if the government compensates those outside the labor force for the fall in real incomes due to pollution taxes.
9. Policymakers are rightly concerned about two major social problems: the degradation of the environment and widespread long-term unemployment. To create a social consensus for wage moderation, there may be a political case for a 'package' deal in the form of the environmental tax reform described here. However, one should be aware that combining both social priorities requires more sacrifices from those outside the labor force: these groups have to pay not only for a cleaner environment but also for the lower tax burden on low-skilled labor.
10. If the government aims for two objectives (*i.e.* a cleaner environment and a higher level of employment), it should in principle use at least two instruments. Conceptually, therefore, one could view this reform as the sum of two separate policies. One policy is aimed at improving the quality of the environment (*i.e.* the pollution tax) and the other is targeted at enhancing employment (*i.e.* the shifting of the tax burden towards transfer recipients).
11. Reducing the tax burden on labor by shifting it to others is likely to be rather difficult for economic and political reasons. Hence, the government may want to take measures to cut the overall tax burden. A lower overall tax burden can be accomplished in four alternative ways. First, public spending can be cut to create the budgetary room to reduce the explicit tax burden. In this way, other public priorities make room for the public priority of the environment. Second, the link between taxes and benefits

could be strengthened, especially in the area of social security. Third, implicit taxes on labor due to labor market regulations and other labor market rigidities can be mitigated. Examples are regulated pay scales, job security legislation, seniority systems, generous unemployment benefits, lax administration of unemployment benefits, and minimum wages. Reducing these implicit 'taxes' may be particularly attractive for those governments that face serious budgetary imbalances and are thus unable to reduce explicit taxes. Moreover, such measures address the labor market imperfections directly. Fourth, when pursuing environmental policies, governments should adopt the most cost-effective instruments. This would contain the rise in the tax burden associated with a higher level of pollution abatement.

12. The degradation of the environment requires a structural change in the way economies operate. Accordingly, the market mechanism needs to function well to ensure that the associated reallocation of production factors can occur smoothly. A well-functioning labor market is particularly important to prevent widespread unemployment among workers currently employed in polluting industries. Furthermore, deregulation of sheltered sectors, which tend to be labor-intensive, facilitates the redeployment of labor. Indeed, a more ambitious environmental policy makes structural adjustment in labor and commodity markets more, rather than less urgent.

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Summary

ENVIRONTMENTAL TAXATION AND EMPLOYMENT

This paper explores how environmental taxes affect employment. It argues that the case for environmental taxes should rest on environmental grounds rather than possibly favorable employment effects. Using pollution taxes to shift the tax burden away from labor is likely to be difficult for economic, social, and political reasons. Moreover, these taxes are likely to raise the overall tax burden – even if the revenues are recycled as lower distortionary taxes. To stimulate employment, governments should rely on alternative instruments targeted at the labor market.